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(54) Telephone transducer.

(57) The present invention relates to a telephone handset using an acoustic low impedance receiver transducer. A good reproduction of the low frequencies is obtained by introducing a front cover (7) having pure acoustic ohmic connections (8, 14) from the front side of the transducer diaphragm to the space (9) within the handset house (2).

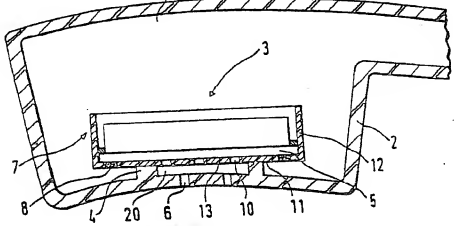

Fig.1

EP 0 364 935 A1

Telephone Transducer

The present invention relates to a telephone handset comprising a house with a receiver transducer which is arranged to be placed against an inward directed support surface in the house and where the transducer is provided with a diaphragm from the front side of which there is a normal slot connection to apertures in receiver side of the house.

In telephone subsets there are mostly used acoustic high impedance transducers. This type of transducer is a fully closed unit with no connections to the inner space of the handset house. When using a high impedance transducer in a telephone subset there will be no or only very little reproduction of the bass range (the low frequencies) and the reproduced voice or music has a metallic sound. The reason for this missing bass reproduction is that when using a telephone there will always be a leak between the handset and the ear (there is no hermetic closure) and this even small leakage will effectively remove the whole bass range. When telephone handsets are tested there is used an artificial ear which is hermetically connected to the telephone handset, whereby the measurements show the correct bass content. There are with other words no or only very little correspondence between the measured and the real situation for the bass range.

The invention relates in particular to telephone handsets using transducers of the acoustic low impedance type. An acoustic low impedance transducer is not a closed unit and makes use of the space which is available behind the transducer. The purpose of using an acoustic low impedance transducer is to obtain a better and more natural reproduction of sound. The acoustic low impedance transducer can tolerate a little leakage between the ear and the telephone handset without losing the bass range.

The acoustic low impedance transducers are used in hi-fi head phones where the situation is different from telephone sets. Head phones have an open structure, whereas it is desirable that a telephone handset is closed in order to prevent the speech of the transmitting subscriber from being overheard by a third person in the receiving end and shielding the ear from surrounding noise.

The object of the present invention is to provide a telephone handset, which when using an acoustic low impedance transducer will give a telephone receiver a better sound reproduction more like the sound reproduction of hi-fi head phones. The main features of the invention are defined in the accompanying patent claims.

In accordance with the invention there is used a transducer front co ar which is mounted on an acoustic low impedance transducer in order to make use of the inner space in a telephone handset. Acoustically we have obtained the same sound transfer function from the transducer to the ear as the transfer function which may be measured between two persons who talk with each other at the distance of one meter. (Reference: CCITT Working Party XII/1. Delayed Contribution No. D49, Geneva, 23rd April - 21st May 1987, Question 12/XII, Source: Brüel & Kjær). This is desirable because there is obtained a more natural reproduction of the speech and sound than what is possible from a conventional telephone. There is in a very simple manner made an acoustic connection from the front side of the transducer diaphragm to the inner space of the telephone handset via a pure acoustic ohmic resistance. By ensuring that this connection is a pure acoustic ohmic connection we have obtained that the lower frequency range will have low impedance without adding undesired resonances in the higher frequency ranges.

Above mentioned and other features and objects of the present invention will clearly appear from the following detailed description of embodiments of the invention taken in conjunction with the drawings, where

Fig. 1 shows the principles of the invention,

Figures 2 and 3 show alternative embodiments of the front cover,

Fig. 4 shows a telephone handset in some greater detail, and

Fig. 5 shows an alternative embodiment of the front cover.

In Fig. 1 is schematically illustrated a telephone handset 1 which comprises a house 2 in which there is arranged a low impedance transducer 3. The transducer 3 is secured in a front cover 7 so that there from the front side of the transducer diaphragm 5 is a normal slot connection to holes or apertures 6 in the house 2. The front cover 7 is secured to a ring shaped support surface 4 in the house 2 in such a way that there is established a pure acoustic ohmic connection 8 from the front side of the transducer diaphragm to the space 9 within the house 2, while maintaining a normal slot connection 10 from the front side of the diaphragm to the holes or apertures 6 in the house 2. Between the holes 10 of the front cover and the holes 6 of the house 2 there is a space 20. The front cover 7 comprises a surface 11 which separates the acoustic ohmic connection 8 from the normal slot connection 10 by letting the surface 11 close tightly against the support surface 4 along the whole periphery. The front cover 7 has the shape of an

open cylindric, preferably circular box, the side walls 12 and the bottom surface 13 of which are adapted to the transducer 3 and it may be integrated with the transducer.

As shown in Figures 1 and 2 the acoustic ohmic connection 8 may be formed in the bottom surface 13 of the front cover, i.e. in the part of the front cover which is practically parallel with the plane 5 of the transducer diaphragm. Alternatively, and as shown in Fig. 3, the acoustic ohmic connection 14 may be formed in the side wall 12 of the front cover. If the cylindrical front cover has a polygon cross-section instead of a circular crossection the connections 14 may be arranged in a plurality or all of the sides. Alternatively the acoustic ohmic connections 8, 14 may be formed in the bottom 13 as well as in the side wall(s) 12 of the front cover 7.

As will be seen from the drawings the acoustic ohmic connection is formed as a number of preferably evenly distributed apertures or slots 8, 14 in the front cover 7. The apertures should have a largest possible area. The apertures or slots 8, 14 are wholly or partly filled or covered with a sound absorbing material 15 such as cotton wool, foamed rubber or the like with relatively low air resistance. The side walls 12 and the bottom surface 13 of the front cover should be as thin as practically possible, in particular in the area close to the ohmic acoustic apertures 8, 14.

In Fig. 4 an embodiment of the invention is shown in greater detail. The ohmic acoustic connections 14 are arranged in the side walls 12 of the front cover. In this embodiment the front cover 7 is integrated with a low impedance transducer 3 and the front cover 7 encloses the edge of the transducer back cover 16. The diaphragm 5 of the transducer is mounted by means of a diaphragm ring 17 which rests against the front cover 7. The surface 11 on the front cover 7 fits tightly against the ring surface 4 on the house 2, so that the connection from the front side of the front cover through the slots 10 in the front cover to the holes 6 in the house 2 is fully separated from the connection from the front side of the diaphragm through the ohmic acoustic connection 14 to the space 9 within the house 2. As in fig. 1 there is a space 25 between the front cover holes 10 and the holes 6 in the house 2.

In Figure 5 is illustrated an alternative embodiment of the front cover 7. The bottom surface 13 of the front cover is provided with a subcover 21 which defines a space 22 corresponding substantially to the space 20 in Figure 1. The subcover may also be made to fit the space 25 in Figure 4. The subcover 21 is provided with apertures 23 which corresponds to the holes or apertures 6 in the house 2. The transducer 3 with front cover 7 will have to be rotated in order to obtain a complete correspondence between these two sets of holes. The purpose of providing the front cover with the subcover is to make sure that the sound reproduction is not disturbed by undesired configurations of the space 20 in Figure 1 and 25 in Figure 4.

As mentioned the front cover should have a small wall size so that it together with the damping material will treat the sound uniformly in the whole frequency range. A wall thickness of about 0,3 mm will be suitable and the front cover may be made from steel sheet. As an alternative the front cover can also be made from some plastic material that should be molded such that the edges of the holes 8, 14 have a wall thickness so that the total attenuation takes place in the molded holes and connections.

The geometry of the connections 8, 14 is not so important when the area is as large as possible and when the connections are provided with a mesh filter. As mesh can be used pieces of very fine woven fabric. The air penetrability of this mesh should be determined in accordance with the type of transducer type used, but it should be rather high. Cotton wool or foamed rubber may be used as damping material. The main feature of the damping materials to be used is that they must attenuate the sound uniformly over the whole frequency ranged.

The advantage of the front cover as described above is that it can be used in existing handsets. There is obtained a more realistic reproduction of sound which is nearly independent of the design of the telephone handset. With this invention it is now possible to use a low impedance telephone with a closed telephone handset. A further advantage is that electronic filters are not necessary and our handset is therefore more economic than known handsets with regard to the space required and to the current consumption.

The above detailed description of embodiments of this invention must be taken as examples only and should not be considered as limitations on the scope of protection.

Claims

1. Telephone handset (1) comprising a house (2) with a receiver transducer (3) which is arranged to be placed against an inward directed surface (4) in the house (2) and where the transducer (3) is provided with a diaphragm (5) from the front side of which there is a normal slot connection to holes or apertures (6) in the house, **characterized in this that** the handset comprises a front cover (7) which is arranged between the mentioned surface

(4) and the transducer (3) such that there is realized a pure acoustic ohmic resistance (8, 14) from the front side of the transducer diaphragm to a space (9) within the house (2), while maintaining the normal slot connection (10) from the front side of the diaphragm to the holes or apertures (6) in the house (2).

2. Handset according to claim 1, characterized in this that the front cover (7) comprises a surface (11) which fits tightly to the inward directed surface (4) in the house (2), so as to separate the acoustic ohmic connection (8, 14) from the normal slot connection (10).

3. Handset according to claim 2, characterized in this that the front cover (7) has the shape of an open cylindric, preferably circular, box, the side wall(s) (12) and bottom surface (13) of which are fitted to the transducer (3) and possibly integrated with the transducer.

4. Handset according to claim 3, characterized in this that the acoustic ohmic connection (8) is formed in the bottom surface (13) of the front cover, i.e. in a part of the front cover (7) which is substantially parallel with the plane of the transducer diaphragm (5).

5. Handset according to claim 3, characterized in this that the acoustic ohmic connection (14) is formed in one (or more) of the side walls (12) of the front cover.

6. Handset according to claim 3, characterized in this that acoustic ohmic connection (8, 14) is formed in the bottom surface (13) as well as in the side wall(s) (12) of the front cover (7).

7. Handset according to any of the above claims, characterized in this that the acoustic ohmic connection is constituted by a number of, preferably evenly distributed, holes or slots (8, 14) in the front cover (7).

8. Handset according to claim 7, characterized in this that the holes or slots (8, 14) are wholly or partly covered or filled with a sound absorbing material (15) such as cotton wool, foamed rubber or the like with relatively low air resistance.

9. Handset according to claim 7 or 8, characterized in this that the wall thickness of the side walls (12) and bottom surface (13) is as thin as practically possible, in particular in the area of the ohmic acoustic holes (8, 14).

10. Handset according to any one of the above claims, characterized in this that the front cover (7) is provided with a subcover (21) which defines a space (22) corresponding to a space (20,25) between the front cover wall (13) and the house (2), and that the subcover (21) is provided with apertures (23) corresponding with the holes or apertures (6) in the house (2).

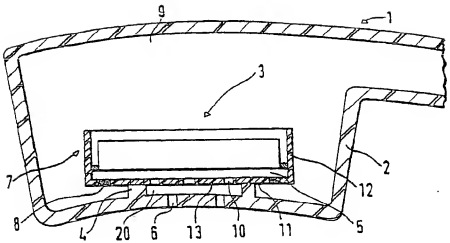

Fig.1

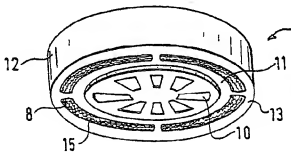

Fig. 2

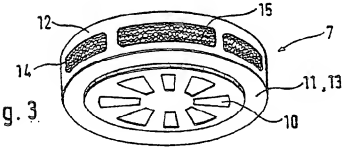

Fig. 3

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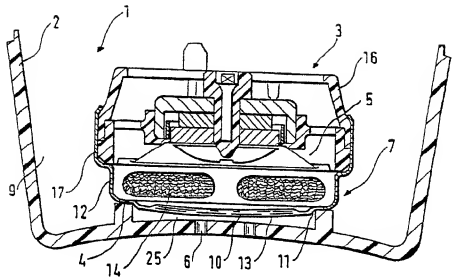

Fig. 4

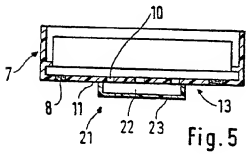

Fig. 5

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 89119213.0

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	US-A- 2 109 761 (H.R. WARNKE) * Whole document*	1-10	H 04 M 1/03

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

H 04 M
H 04 R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
STOCKHOLM	18-12-1989	FENGER-KROG S.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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